



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

004955 7590 03/17/2004

WARE FRESSOLA VAN DER SLUYS &
ADOLPHSON, LLP
BRADFORD GREEN BUILDING 5
755 MAIN STREET, P O BOX 224
MONROE, CT 06468

EXAMINER

MILLER, PATRICK L

ART UNIT

PAPER NUMBER

2837

DATE MAILED: 03/17/2004

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/019,849	11/01/2001	Roland Dieterle	870-003-139	1959

TITLE OF INVENTION: METHOD FOR REGULATING THE ROTATIONAL SPEED OF A MOTOR AND A MOTOR FOR CARRYING OUT A METHOD OF THIS TYPE

APPLN. TYPE	SMALL ENTITY	ISSUE FEE	PUBLICATION FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	\$1330	\$0	\$1330	06/17/2004

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE REFLECTS A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE APPLIED IN THIS APPLICATION. THE PTOL-85B (OR AN EQUIVALENT) MUST BE RETURNED WITHIN THIS PERIOD EVEN IF NO FEE IS DUE OR THE APPLICATION WILL BE REGARDED AS ABANDONED.

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status is changed, pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above and notify the United States Patent and Trademark Office of the change in status, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check the box below and enclose the PUBLICATION FEE and 1/2 the ISSUE FEE shown above.

☐ Applicant claims SMALL ENTITY status.
See 37 CFR 1.27.

II. PART B - FEE(S) TRANSMITTAL should be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). Even if the fee(s) have already been paid, Part B - Fee(s) Transmittal should be completed and returned. If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail

**Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
(703) 746-4000**

or Fax

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 4 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Legibly mark-up with any corrections or use Block 1)

004955 7590 03/17/2004

**WARE FRESSOLA VAN DER SLUYS &
ADOLPHSON, LLP
BRADFORD GREEN BUILDING 5
755 MAIN STREET, P O BOX 224
MONROE, CT 06468**

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/019,849	11/01/2001	Roland Dieterle	870-003-139	1959
------------	------------	-----------------	-------------	------

TITLE OF INVENTION: METHOD FOR REGULATING THE ROTATIONAL SPEED OF A MOTOR AND A MOTOR FOR CARRYING OUT A METHOD OF THIS TYPE

APPLN. TYPE	SMALL ENTITY	ISSUE FEE	PUBLICATION FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	\$1330	\$0	\$1330	06/17/2004

EXAMINER	ART UNIT	CLASS-SUBCLASS
MILLER, PATRICK L	2837	318-268000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. Inclusion of assignee data is only appropriate when an assignment has been previously submitted to the USPTO or is being submitted under separate cover. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent); ☐ individual ☐ corporation or other private group entity ☐ government

4a. The following fee(s) are enclosed:

- ☐ Issue Fee
- ☐ Publication Fee
- ☐ Advance Order - # of Copies _____

4b. Payment of Fee(s):

- ☐ A check in the amount of the fee(s) is enclosed.
- ☐ Payment by credit card. Form PTO-2038 is attached.
- ☐ The Director is hereby authorized by charge the required fee(s), or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

Director for Patents is requested to apply the Issue Fee and Publication Fee (if any) or to re-apply any previously paid issue fee to the application identified above.

(Authorized Signature)	(Date)
<p>NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.</p> <p>This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, Alexandria, Virginia 22313-1450.</p> <p>Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.</p>	

TRANSMIT THIS FORM WITH FEE(S)



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/019,849	11/01/2001	Roland Dieterle	870-003-139	1959

004955 7590 03/17/2004
WARE FRESSOLA VAN DER SLUYS &
ADOLPHSON, LLP
BRADFORD GREEN BUILDING 5
755 MAIN STREET, P O BOX 224
MONROE, CT 06468

EXAMINER

MILLER, PATRICK L

ART UNIT PAPER NUMBER

2837

DATE MAILED: 03/17/2004

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 63 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 63 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) system (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (703) 305-1383. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at (703) 305-8283.

in

Notice of Allowability	Application No.	Applicant(s)	
	10/019,849	DIETERLE ET AL.	
	Examiner	Art Unit	
	Patrick Miller	2837	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 12/04/03.
2. ☒ The allowed claim(s) is/are 42-71 and 75-100.
3. ☒ The drawings filed on 01 November 2001 are accepted by the Examiner.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☒ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- | | |
|---|--|
| 1. <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 5. <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 6. <input checked="" type="checkbox"/> Interview Summary (PTO-413),
Paper No./Mail Date <u>03012004</u> . |
| 3. <input type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date _____ | 7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit
of Biological Material | 8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance |
| | 9. <input type="checkbox"/> Other _____ |


KIMBERLY LOCKETT
PRIMARY EXAMINER

DETAILED ACTION

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.
2. Authorization for this examiner's amendment was given in a telephone interview with Milton Oliver (28,333) on March 2, 2004.
3. The application has been amended as follows:
 - Claim 42, line 20 of claim, delete "a" in "said a target frequency."

Miscellaneous

4. Applicant noted that the foreign priority dates are incorrect. Specifically, the Applicant has two foreign priority documents and the dates are reversed. DE 19949693.5 should have a filing date of 10/15/1999, and DE 19945313.6 should have a filing date of 09/22/1999. Examiner noted this correction on the Bibliographical Data Sheet.

Response to Arguments

5. Applicant's arguments, with respect to the nonstatutory double patenting rejection of claims 62-69 have been fully considered and are persuasive. The rejection of claims 62-69 has been withdrawn.
6. Applicant's arguments, see page 28 (1st full paragraph, lines 1-2) of amendment filed on 12/04/03, with respect to claims 42 and 43 have been fully considered and are persuasive. The rejection of claims 42-44 has been withdrawn.

Allowable Subject Matter

7. Claims 42-71 and 75-100 are allowed.
8. The following is an examiner's statement of reasons for allowance:
 - With respect to claims 42 and 62, the Prior Art discloses controlling a motor's rotation frequency toward a target frequency. However, the primary reason for allowance is because the Prior Art does not disclose controlling the rotational frequency of a motor by obtaining the actual rotational frequency of the motor in a first time period and a second time period based on a target rotational frequency, *wherein the two time periods overlap*.
 - With respect to claim 75, the primary reason for allowance is because the Prior Art does not disclose determining the frequencies of sensed signals using only signal pulses and edges, and separately ascertaining a fourth instant at which a frequency datum occurs.
 - With respect to claim 83, the Prior Art discloses methods that determine the target speed based on a first time period indicative of motor speed; however, the primary reason for allowance is because the Prior Art does not disclose measuring a time segment between edges of the target frequency to obtain a second numerical value representative of the frequency of the target frequency signal.
9. Therefore, based on the arguments and amendments presented by the Applicant, the Examiner acknowledges the Prior Art fails to make obvious the Applicant's claimed invention.

10. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Patrick Miller whose telephone number is 571-272-2070. The examiner can normally be reached on M-F, 8:30-5:30.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Nappi can be reached on 571-272-2800 ext 37. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9318.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-306-3431.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Patrick Miller
Examiner
Art Unit 2837

pm
March 2, 2004


KIMBERLY LOCKETT
PRIMARY EXAMINER

Amendment

Applicant: Michael Paul Tankard

Serial No.: 10/163,945

Filed: June 5, 2002

Docket No.: K315.124.101

Title: CONTROL STRATEGY FOR SWITCHED RELUCTANCE DRIVE SYSTEMS

Amendments to the Claims:

This listing of claims replaces all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A method of reducing the magnitude of transient voltages in a switched reluctance drive system which comprises a reluctance machine having a stator with at least one phase winding and a moving part which is movable in relation to the stator, switch means connected across ~~the or~~ each phase winding which are configurable into an energizing mode in which the phase winding is energized through the switch means from a supply for a phase conduction period, a freewheeling mode in which there is no applied voltage and current in the winding recirculates, and a de-energizing mode in which the voltage across the at least one phase winding is reversed, and a DC link capacitor connected across the supply side of the switch means, the method comprising:

initiating the energizing mode at the beginning of the phase conduction period of the at least one phase winding;

initiating the freewheeling mode, causing a first transient voltage spike across the capacitor; and

initiating the de-energizing mode a predetermined period after initiating the freewheeling mode, causing a second transient voltage spike across the capacitor;

wherein the second transient voltage spike has a magnitude that does not exceed the magnitude of the first transient voltage spike.

Amendment

Applicant: Michael Paul Tankard

Serial No.: 10/163,945

Filed: June 5, 2002

Docket No.: K315.124.101

Title: CONTROL STRATEGY FOR SWITCHED RELUCTANCE DRIVE SYSTEMS

2. (Cancelled)

3. (Cancelled)

4. (Cancelled)

5. (Currently Amended) A method as claimed in claim 21, in which the ~~de-energizing~~
~~mode is initiated after a predetermined period which is fixed according to the decay of the first~~
transient voltage spike.

6. (Original) A method as claimed in claim 5, in which the predetermined period is fixed to
cause the second voltage spike to be of substantially the same magnitude as the first transient
voltage spike.

7. (Original) A method of reducing the magnitude of transient voltages in a switched
reluctance drive system which comprises a reluctance machine having a stator with at least one
phase winding and a moving part which is movable in relation to the stator, switch means
connected across the or each phase winding which are configurable into an energizing mode in
which the phase winding is energized through the switch means from a supply for a phase
conduction period, a freewheeling mode in which there is no applied voltage and the current in
the winding recirculates, as the voltage across the winding decays, and a de-energizing mode in
which the voltage across the at least one phase winding is reversed, and a DC link capacitor
connected across the supply side of the switch means, the method comprising:

Amendment

Applicant: Michael Paul Tankard

Serial No.: 10/163,945

Filed: June 5, 2002

Docket No.: K315.124.101

Title: CONTROL STRATEGY FOR SWITCHED RELUCTANCE DRIVE SYSTEMS

initiating the energizing mode at the beginning of the phase conduction period of the at least one phase winding;

initiating the freewheeling mode, causing a first transient voltage spike across the capacitor;

initiating the de-energizing mode after initiating the freewheeling mode, causing a second transient voltage spike across the capacitor; and

adjusting the period between the first and second transient voltage spikes to balance the magnitude of the second transient voltage spike against the time taken to de-energize the winding.

8. (Original) A method as claimed in claim 7, in which the period is adjusted so that the first and second transient voltage spikes are of substantially equal magnitude.

9. (Currently Amended) A switched reluctance drive system, comprising:

a reluctance machine having a stator with at least one phase winding and a moving part which is movable in relation to the stator;

at least one switch connected across the at least one phase winding, the at least one switch being configurable into an energizing mode in which the phase winding is energized through the at least one switch from a supply for a phase conduction period, a freewheeling mode in which there is no applied voltage and current in the winding recirculates, and a de-energizing mode in which the voltage across the at least one phase winding is reversed; and

a DC link capacitor connected across the supply side of the at least one switch;

Amendment

Applicant: Michael Paul Tankard

Serial No.: 10/163,945

Filed: June 5, 2002

Docket No.: K315.124.101

Title: CONTROL STRATEGY FOR SWITCHED RELUCTANCE DRIVE SYSTEMS

wherein the energizing mode is initiated at the beginning of the phase conduction period of the at least one phase winding, further wherein initiation of the freewheeling mode causes a first transient voltage spike across the capacitor, and further wherein the de-energizing mode is initiated a predetermined period after the freewheeling mode is initiated, causing a second transient voltage spike across the capacitor;

wherein the second transient voltage spike has a magnitude that does not exceed the magnitude of the first transient voltage spike.

10. (Cancelled)

11. (Currently Amended) A switched reluctance drive system as claimed in claim 9, in which the ~~de-energizing mode is initiated after a predetermined period which is~~ fixed according to the decay of the first transient voltage spike.

12. (Original) A switched reluctance drive system as claimed in claim 11, in which the predetermined period is fixed to cause the second voltage spike to be of substantially the same magnitude as the first transient voltage spike.

13. (Original) A switched reluctance drive system, comprising:

a reluctance machine having a stator with at least one phase winding and a moving part which is movable in relation to the stator;

at least one switch connected across the at least one phase winding, the at least one switch being configurable into an energizing mode in which the phase winding is energized through the at least one switch from a supply for a phase conduction period, a freewheeling

Amendment

Applicant: Michael Paul Tankard

Serial No.: 10/163,945

Filed: June 5, 2002

Docket No.: K315.124.101

Title: CONTROL STRATEGY FOR SWITCHED RELUCTANCE DRIVE SYSTEMS

mode in which there is no applied voltage and current in the winding recirculates, and a de-energizing mode in which the voltage across the at least one phase winding is reversed; and

a DC link capacitor connected across the supply side of the at least one switch;

wherein the energizing mode is initiated at the beginning of the phase conduction period of the at least one phase winding, further wherein initiation of the freewheeling mode causes a first transient voltage spike across the capacitor, further wherein the de-energizing mode is initiated after the freewheeling mode is initiated, causing a second transient voltage spike across the capacitor, and further wherein the period between the first and second transient voltage spikes is adjusted to balance the magnitude of the second transient voltage spike against time taken to de-energize the winding.

14. (Original) A switched reluctance drive system as claimed in claim 13, in which the period is adjusted so that the first and second transient voltage spikes are of substantially equal magnitude.

15. (New) A method of reducing the magnitude of transient voltages in a switched reluctance drive system which comprises a reluctance machine having a stator with at least one phase winding and a moving part which is movable in relation to the stator, switch means connected across each phase winding which are configurable into an energizing mode in which the phase winding is energized through the switch means from a supply for a phase conduction period, a freewheeling mode in which there is no applied voltage and current in the winding recirculates, and a de-energizing mode in which the voltage across the at least one phase winding

Amendment

Applicant: Michael Paul Tankard

Serial No.: 10/163,945

Filed: June 5, 2002

Docket No.: K315.124.101

Title: CONTROL STRATEGY FOR SWITCHED RELUCTANCE DRIVE SYSTEMS

is reversed, and a DC link capacitor connected across the supply side of the switch means, the method comprising:

initiating the energizing mode at the beginning of the phase conduction period of the at least one phase winding;

initiating the freewheeling mode, causing a first transient voltage spike across the capacitor; and

initiating the de-energizing mode a predetermined period after initiating the freewheeling mode, causing a second transient voltage spike across the capacitor, wherein the predetermined period is fixed according to the decay of the first transient voltage spike.

16. (New) A method as claimed in claim 15, in which the predetermined period is fixed to cause the second voltage spike to be of substantially the same magnitude as the first transient voltage spike.

17. (New) A switched reluctance drive system, comprising:

a reluctance machine having a stator with at least one phase winding and a moving part which is movable in relation to the stator;

at least one switch connected across the at least one phase winding, the at least one switch being configurable into an energizing mode in which the phase winding is energized through the at least one switch from a supply for a phase conduction period, a freewheeling mode in which there is no applied voltage and current in the winding recirculates, and a de-energizing mode in which the voltage across the at least one phase winding is reversed; and

a DC link capacitor connected across the supply side of the at least one switch;

Amendment

Applicant: Michael Paul Tankard

Serial No.: 10/163,945

Filed: June 5, 2002

Docket No.: K315.124.101

Title: CONTROL STRATEGY FOR SWITCHED RELUCTANCE DRIVE SYSTEMS

wherein the energizing mode is initiated at the beginning of the phase conduction period of the at least one phase winding, further wherein initiation of the freewheeling mode causes a first transient voltage spike across the capacitor, and further wherein the de-energizing mode is initiated a predetermined period after the freewheeling mode is initiated, causing a second transient voltage spike across the capacitor, wherein the predetermined period is fixed according to the decay of the first transient voltage spike.

18. (New) A switched reluctance drive system as claimed in claim 17, wherein the second transient voltage spike has a magnitude that does not exceed the magnitude of the first transient voltage spike.

19. (New) A switched reluctance drive system as claimed in claim 17, in which the predetermined period is fixed to cause the second voltage spike to be of substantially the same magnitude as the first transient voltage spike.

20. (New) A method of reducing the magnitude of transient voltages in a switched reluctance drive system which comprises a reluctance machine having a stator with at least one phase winding and a moving part which is movable in relation to the stator, and switch means connected across each phase winding which are configurable into an energizing mode in which the phase winding is energized through the switch means from a supply for a phase conduction period, a freewheeling mode in which there is no applied voltage and current in the winding

Amendment

Applicant: Michael Paul Tankard

Serial No.: 10/163,945

Filed: June 5, 2002

Docket No.: K315.124.101

Title: CONTROL STRATEGY FOR SWITCHED RELUCTANCE DRIVE SYSTEMS

recirculates, and a de-energizing mode in which the voltage across the at least one phase winding is reversed, the method comprising:

initiating the energizing mode at the beginning of the phase conduction period of the at least one phase winding;

initiating the freewheeling mode, causing a first transient voltage spike; and

initiating the de-energizing mode a predetermined period after initiating the freewheeling mode, causing a second transient voltage spike;

wherein the second transient voltage spike has a magnitude that does not exceed the magnitude of the first transient voltage spike.

21. (New) A method of reducing the magnitude of transient voltages in a switched reluctance drive system which comprises a reluctance machine having a stator with at least one phase winding and a moving part which is movable in relation to the stator, and switch means connected across each phase winding which are configurable into an energizing mode in which the phase winding is energized through the switch means from a supply for a phase conduction period, a freewheeling mode in which there is no applied voltage and the current in the winding recirculates, as the voltage across the winding decays, and a de-energizing mode in which the voltage across the at least one phase winding is reversed, the method comprising:

initiating the energizing mode at the beginning of the phase conduction period of the at least one phase winding;

initiating the freewheeling mode, causing a first transient voltage spike;

initiating the de-energizing mode after initiating the freewheeling mode, causing a second

Amendment

Applicant: Michael Paul Tankard

Serial No.: 10/163,945

Filed: June 5, 2002

Docket No.: K315.124.101

Title: CONTROL STRATEGY FOR SWITCHED RELUCTANCE DRIVE SYSTEMS

transient voltage spike; and

adjusting the period between the first and second transient voltage spikes to balance the magnitude of the second transient voltage spike against the time taken to de-energize the winding.

22. (New) A switched reluctance drive system, comprising:

a reluctance machine having a stator with at least one phase winding and a moving part which is movable in relation to the stator; and

at least one switch connected across the at least one phase winding, the at least one switch being configurable into an energizing mode in which the phase winding is energized through the at least one switch from a supply for a phase conduction period, a freewheeling mode in which there is no applied voltage and current in the winding recirculates, and a de-energizing mode in which the voltage across the at least one phase winding is reversed;

wherein the energizing mode is initiated at the beginning of the phase conduction period of the at least one phase winding, further wherein initiation of the freewheeling mode causes a first transient voltage spike, and further wherein the de-energizing mode is initiated a predetermined period after the freewheeling mode is initiated, causing a second transient voltage spike;

wherein the second transient voltage spike has a magnitude that does not exceed the magnitude of the first transient voltage spike.

23. (New) A switched reluctance drive system, comprising:

Amendment

Applicant: Michael Paul Tankard

Serial No.: 10/163,945

Filed: June 5, 2002

Docket No.: K315.124.101

Title: CONTROL STRATEGY FOR SWITCHED RELUCTANCE DRIVE SYSTEMS

a reluctance machine having a stator with at least one phase winding and a moving part which is movable in relation to the stator; and

at least one switch connected across the at least one phase winding, the at least one switch being configurable into an energizing mode in which the phase winding is energized through the at least one switch from a supply for a phase conduction period, a freewheeling mode in which there is no applied voltage and current in the winding recirculates, and a de-energizing mode in which the voltage across the at least one phase winding is reversed;

wherein the energizing mode is initiated at the beginning of the phase conduction period of the at least one phase winding, further wherein initiation of the freewheeling mode causes a first transient voltage spike, further wherein the de-energizing mode is initiated after the freewheeling mode is initiated, causing a second transient voltage spike, and further wherein the period between the first and second transient voltage spikes is adjusted to balance the magnitude of the second transient voltage spike against time taken to de-energize the winding.

24. (New) A method of reducing the magnitude of transient voltages in a switched reluctance drive system which comprises a reluctance machine having a stator with at least one phase winding and a moving part which is movable in relation to the stator, and switch means connected across each phase winding which are configurable into an energizing mode in which the phase winding is energized through the switch means from a supply for a phase conduction period, a freewheeling mode in which there is no applied voltage and current in the winding recirculates, and a de-energizing mode in which the voltage across the at least one phase winding is reversed, the method comprising:

Amendment

Applicant: Michael Paul Tankard

Serial No.: 10/163,945

Filed: June 5, 2002

Docket No.: K315.124.101

Title: CONTROL STRATEGY FOR SWITCHED RELUCTANCE DRIVE SYSTEMS

initiating the energizing mode at the beginning of the phase conduction period of the at least one phase winding;

initiating the freewheeling mode, causing a first transient voltage spike; and

initiating the de-energizing mode a predetermined period after initiating the freewheeling mode, causing a second transient voltage spike, wherein the predetermined period is fixed according to the decay of the first transient voltage spike.

25. (New) A switched reluctance drive system, comprising:

a reluctance machine having a stator with at least one phase winding and a moving part which is movable in relation to the stator; and

at least one switch connected across the at least one phase winding, the at least one switch being configurable into an energizing mode in which the phase winding is energized through the at least one switch from a supply for a phase conduction period, a freewheeling mode in which there is no applied voltage and current in the winding recirculates, and a de-energizing mode in which the voltage across the at least one phase winding is reversed;

wherein the energizing mode is initiated at the beginning of the phase conduction period of the at least one phase winding, further wherein initiation of the freewheeling mode causes a first transient voltage spike, and further wherein the de-energizing mode is initiated a predetermined period after the freewheeling mode is initiated, causing a second transient voltage spike, wherein the predetermined period is fixed according to the decay of the first transient voltage spike.

Amendment

Applicant: Michael Paul Tankard

Serial No.: 10/163,945

Filed: June 5, 2002

Docket No.: K315.124.101

Title: CONTROL STRATEGY FOR SWITCHED RELUCTANCE DRIVE SYSTEMS

Amendments to the Drawings:

The attached sheet of drawings adds prior art legends to Figures 5(a) - 5(b) and replaces the original sheet including Figures 5(a) - 5(b).

Attachments: Replacement Sheet

Annotated Sheet Showing Changes